DRINKING WATER SURVEILLANCE PROGRAM

ST. THOMAS (ELGIN) WATER SUPPLY SYSTEM

ANNUAL REPORT 1990

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

ST THOMAS (ELGIN) WATER SUPPLY SYSTEM
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The St. Thomas (Elgin) water supply system is a conventional treatment plant which treats water from Lake Erie. The process consists of coagulation, flocculation, sedimentation, filtration, taste and odour control, fluoridation and disinfection. This plant has a rated capacity of 45.4 x 1000 m^3/day. The St. Thomas (Elgin) water supply system serves a population of approximately 54,200.

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The St. Thomas (Elgin) water treatment plant, for the sample year of 1990, produced good quality water and this was maintained in the distribution system.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS)

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

	SCAN	SITE RAW TESTS	RAW POSITIVE	RAW %POSITIVE	SITE TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE	SITE 2 TESTS	SITE 2 POSITIVE	SITE 2 %POSITIVE
	BACTERIOLOGICAL	18	11	61	6	0	0	6	0	0	6	0	0
	CHEMISTRY (FLD)	18	18	100	36	36	100	66	66	100	72	70	97
	CHEMISTRY (LAB)	132	111	84	132	97	73	209	175	83	228	194	85
	METALS	144	59	40	144	44	30	253	94	37	276	109	39
	CHLOROAROMATICS	84	0	0	70	0	0	84	0	0	84	0	0
	CHLOROPHENOLS	6	0	0	12	0	0	.	.	.	.	.	.
	PAH	84	0	0	84	0	0	17	0	0	17	0	0
	PESTICIDES & PCB	204	0	0	182	0	0	127	0	0	127	0	0
	PHENOLICS	6	0	0	4	1	25	.	.	.	.	.	.
	SPECIFIC PESTICIDES	40	0	0	57	0	0	6	0	0	6	0	0
	VOLATILES	174	0	0	174	24	13	174	24	13	174	24	13
TOTAL		917	201		907	202		942	359		990	397	

DRINKING WATER SURVEILLANCE PROGRAM

ST THOMAS (ELGIN) WATER SUPPLY SYSTEM
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the St. Thomas water treatment plant in the spring of 1987. Previous annual reports have been published for 1987, 1988 and 1989.

PLANT DESCRIPTION

The St. Thomas (Elgin) water supply system is a conventional treatment plant which treats water from Lake Erie. The process consists of coagulation, flocculation, sedimentation, filtration, taste and odour control, fluoridation and disinfection. This plant has a rated capacity of 45.4 x 1000 m^3/day. The St. Thomas (Elgin water supply system) serves a population of approximately 54,200.

The sample day flows were 23.1 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing

samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated and distributed water. No results were above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher

temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 4 of 18 treated and distributed water samples with a maximum reported value of 21.0°C.

CHEMISTRY (LAB)

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 18 of 18 treated and distributed water samples with a maximum reported value of 133.2 mg/L.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWOs Maximum Acceptable Concentration for turbidity is 1 Formazin Turbidity Unit (FTU).

The laboratory turbidity of 4.5 FTU in one treated sample exceeded the Maximum Acceptable Concentration of 1 FTU. This result was not confirmed by the corresponding field turbidity; a more reliable test.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 1 of 18 treated and distributed water samples with a maximum reported value of 110.0 ug/L.

Iron exceeded the ODWO Maximum Desirable Concentration of 300 ug/L in 1 distributed water sample with a maximum reported value of 570.0 ug/L. Other metal results, for this sample, indicated that an analytical problem at the laboratory may have occurred.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticide scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results exceeded the guideline.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 18 treated and distributed water samples analyzed with a maximum level of 41.5 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The St. Thomas (Elgin) water treatment plant, for the sample year of 1990, produced good quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

FIGURE 1

ELGIN/ST THOMAS WTP

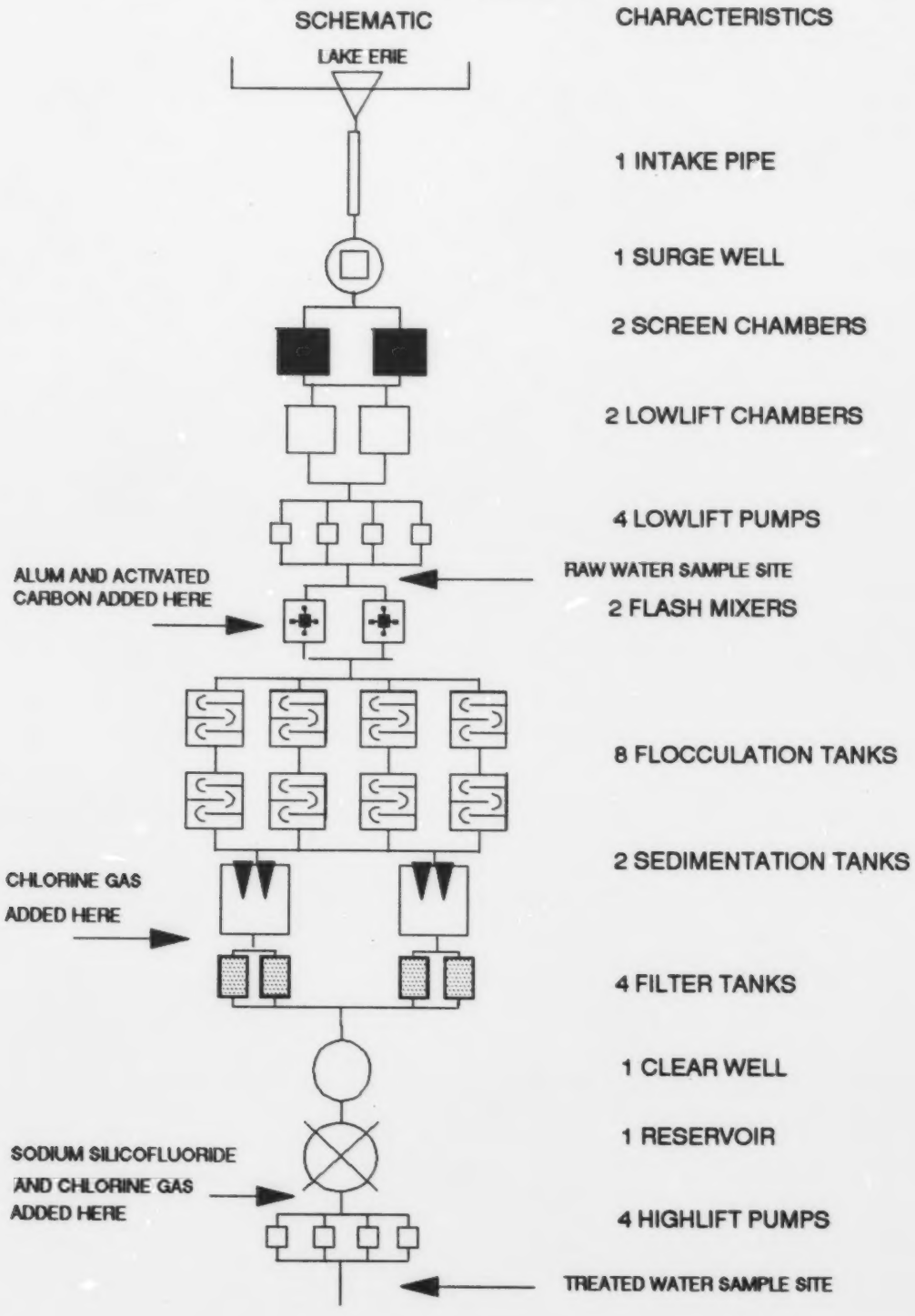

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 210000871
PLANT NAME: ST THOMAS (ELGIN WSS)

DISTRICT: LONDON
REGION: SOUTHWEST
DISTRICT OFFICER :J. MANUEL

UTM #: 174867854721230

PLANT SUPERINTENDENT: MR. R. POWER

ADDRESS: COUNTY RD 24
ST THOMAS, ONT
N5P 3V6
(519-782-3101)

MUNICIPALITY: ST THOMAS
AUTHORITY: PROVINCIAL

PLANT INFORMATION

PLANT VOLUME:	24.190	(X 1000 M3)
DESIGN CAPACITY:	90.800	(X 1000 M3/DAY)
RATED CAPACITY:	45.400	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
BAYHAM TWP	3,922
FORD MOTOR CO	0
MALAHIDE TWP	5,257
PT BRUCE VILLAGE	421
PT. BURIVELL VILLAGE	681
SOUTHWOLD TWP	4,342
ST THOMAS	31,350
VIENNA VILLAGE	282
YARMOUTH TWP	7,927

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
ALUMINUM	TREATED WATER IN LAB	WEEKLY
FREE CHLORINE RESIDUAL	TREATED WATER IN LAB	DAILY
TOTAL CHLORINE RESIDUAL	TREATED WATER IN LAB	EVERY 4 HOURS
FLUORIDE	TREATED WATER IN LAB	DAILY
PH	TREATED WATER IN LAB	DAILY
TEMPERATURE	TREATED WATER IN LAB	DAILY
TURBIDITY	TREATED WATER IN LAB RAW WATER	EVERY 4 HOURS CONTINUOUS

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) SAMPLE DAY CONDITIONS FOR 1990

DATE	DELAY * TIME(HRS)	FLOW (1000M3)	TREATMENT CHEMICAL DOSAGES (MG/L) COAGULATION POLYMERIZED ALUMINUM	TASTE & ODOUR ACTIVATED CARBON POWDER	PRE CHLORINATION CHLORINE	POST CHLORINATION CHLORINE	FLUORIDATION SODIUM SILICOFLUORIDE
JAN 03	10.17	23.185	6.50	3.00	1.10	.30	1.00
MAR 06	10.17	23.185	16.50	3.00	1.26	.19	1.00
MAY 08	10.17	23.185	8.50	4.00	1.20	.30	1.00
JUL 04	10.17	23.185	6.50	3.10	1.45	.34	1.00
SEP 05	10.17	23.185	5.50	4.00	1.60	.50	1.00
NOV 06	10.17	23.185	20.00	3.10	1.15	.32	1.10

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN	RAW			TREATED			SITE 1			SITE 2		
PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL												
FECAL COLIFORM MF	6	3	0	.	.	.	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	6	0	0	6	0	0	6	0	0
TOTAL COLIFORM MF	6	3	0	.	.	.	.	.	.	.	.	.
T COLIFORM BCKGRD MF	6	5	0	.	.	.	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	18	11	0	6	0	0	6	0	0	6	0	0
CHEMISTRY (FLD)												
FLD CHLORINE (COMB)	.	.	.	6	6	0	11	11	0	12	12	0
FLD CHLORINE FREE	.	.	.	6	6	0	11	11	0	12	10	0
FLD CHLORINE (TOTAL)	.	.	.	6	6	0	11	11	0	12	12	0
FLD PH	6	6	0	6	6	0	11	11	0	12	12	0
FLD TEMPERATURE	6	6	0	6	6	0	11	11	0	12	12	0
FLD TURBIDITY	6	6	0	6	6	0	11	11	0	12	12	0
*TOTAL SCAN CHEMISTRY (FLD)	18	18	0	36	36	0	66	66	0	72	70	0
CHEMISTRY (LAB)												
ALKALINITY	6	6	0	6	6	0	11	11	0	12	12	0
CALCIUM	6	6	0	6	6	0	11	11	0	12	12	0
CYANIDE	6	0	0	6	0	0	.	.	.	.	.	.
CHLORIDE	6	6	0	6	6	0	11	11	0	12	12	0
COLOUR	6	1	3	6	0	5	11	0	9	12	0	10
CONDUCTIVITY	6	6	0	6	6	0	11	11	0	12	12	0
DISS ORG CARBON	6	6	0	6	6	0	11	11	0	12	12	0
FLUORIDE	6	6	0	6	6	0	11	11	0	12	12	0
HARDNESS	6	6	0	6	6	0	11	11	0	12	12	0
IONCAL	6	6	0	6	6	0	11	11	0	12	12	0
LANGELIERS INDEX	6	6	0	6	6	0	11	11	0	12	12	0
MAGNESIUM	6	6	0	6	6	0	11	11	0	12	12	0
SODIUM	6	6	0	6	6	0	11	11	0	12	12	0
AMMONIUM TOTAL	6	0	0	6	0	0	11	0	4	12	0	3
NITRITE	6	4	2	6	1	5	11	0	8	12	2	9
TOTAL NITRATES	6	6	0	6	6	0	11	11	0	12	12	0
NITROGEN TOT KJELD	6	6	0	6	6	0	11	11	0	12	12	0
PH	6	6	0	6	6	0	11	11	0	12	12	0
PHOSPHORUS FIL REACT	6	4	1	6	0	4	.	.	.	.	.	.
PHOSPHORUS TOTAL	6	6	0	6	0	5	.	.	.	.	.	.
SULPHATE	6	6	0	6	6	0	11	11	0	12	12	0
TURBIDITY	6	6	0	6	6	0	11	10	1	12	12	0
*TOTAL SCAN CHEMISTRY (LAB)	132	111	6	132	97	19	209	175	22	228	194	22

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS												
SILVER	6	0	1	6	0	0	11	0	1	12	0	1
ALUMINUM	6	6	0	6	6	0	11	11	0	12	11	1
ARSENIC	6	1	5	6	0	6	11	0	11	12	0	12
BARIUM	6	6	0	6	6	0	11	11	0	12	11	1
BORON	6	4	2	6	6	0	11	10	1	12	10	1
BERYLLIUM	6	0	1	6	0	1	11	0	1	12	0	1
CADMIUM	6	0	2	6	0	1	11	1	3	12	0	1
COBALT	6	1	5	6	0	4	11	0	9	12	0	9
CHROMIUM	6	0	4	6	0	5	11	0	7	12	0	7
COPPER	6	1	5	6	0	6	11	5	6	12	7	5
IRON	6	6	0	6	0	4	11	0	2	12	1	11
MERCURY	6	0	2	6	0	2	.	.	.	.	.	.
MANGANESE	6	6	0	6	2	4	11	7	4	12	12	0
MOLYBDENUM	6	5	1	6	6	0	11	11	0	12	11	1
NICKEL	6	1	5	6	1	4	11	1	9	12	1	11
LEAD	6	3	3	6	0	4	11	7	4	12	8	4
ANTIMONY	6	1	5	6	2	4	11	2	9	12	9	3
SELENIUM	6	0	0	6	0	3	11	0	2	12	1	6
STRONTIUM	6	6	0	6	6	0	11	11	0	12	12	0
TITANIUM	6	5	1	6	3	3	11	3	8	12	4	8
THALLIUM	6	0	0	6	0	0	11	0	0	12	0	1
URANIUM	6	0	6	6	0	6	11	0	11	12	0	12
VANADIUM	6	3	3	6	3	3	11	4	7	12	3	9
ZINC	6	4	2	6	3	3	11	10	1	12	8	4
*TOTAL SCAN METALS	144	59	53	144	44	63	253	94	96	276	109	109
*TOTAL GROUP INORGANIC & PHYSICAL	294	188	59	312	177	82	528	335	118	576	373	131
COBALT 60	1	0	0	1	0	0	.	.	.	.	.	.
CESIUM 134	1	0	0	1	0	0	.	.	.	.	.	.
CESIUM 137	1	0	0	1	0	0	.	.	.	.	.	.
GROSS ALPHA COUNT	1	1	0	1	0	0	.	.	.	.	.	.
GROSS BETA COUNT	1	1	0	.	.	.	.	.	.	.	.	.
TRITIUM	1	0	0	1	0	0	.	.	.	.	.	.
IODINE 131	1	0	0	1	0	0	.	.	.	.	.	.
*TOTAL SCAN	7	2	0	6	0	0	0	0	0	0	0	0
CHLOROAROMATICS												
HEXACHLOROBUTADIENE	6	0	0	5	0	0	6	0	0	6	0	0
123 TRICHLOROBENZENE	6	0	0	5	0	0	6	0	0	6	0	0
1234 T-CHLOROBENZENE	6	0	0	5	0	0	6	0	0	6	0	0
1235 T-CHLOROBENZENE	6	0	0	5	0	0	6	0	0	6	0	0
124 TRICHLOROBENZENE	6	0	0	5	0	0	6	0	0	6	0	0
1245 T-CHLOROBENZENE	6	0	0	5	0	0	6	0	0	6	0	0
135 TRICHLOROBENZENE	6	0	0	5	0	0	6	0	0	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
HCB	6	0	0	5	0	0	6	0	0	6	0	0
HEXACHLOROETHANE	6	0	0	5	0	0	6	0	0	6	0	0
OCTACHLOROSTYRENE	6	0	0	5	0	0	6	0	0	6	0	0
PENTACHLOROBENZENE	6	0	0	5	0	0	6	0	0	6	0	0
236 TRICHLOROTOLUENE	6	0	0	5	0	0	6	0	0	6	0	0
245 TRICHLOROTOLUENE	6	0	0	5	0	0	6	0	0	6	0	0
26A TRICHLOROTOLUENE	6	0	0	5	0	0	6	0	0	6	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	0	70	0	0	84	0	0	84	0	0
CHLOROPHENOLS												
234 TRICHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
2345 T-CHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
2356 T-CHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
245-TRICHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
246-TRICHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
PENTACHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS	6	0	0	12	0	0	0	0	0	0	0	0
PAH												
PHENANTHRENE	5	0	0	5	0	0	1	0	0	1	0	0
ANTHRACENE	5	0	0	5	0	0	1	0	0	1	0	0
FLUORANTHENE	5	0	0	5	0	0	1	0	0	1	0	0
PYRENE	5	0	0	5	0	0	1	0	0	1	0	0
BENZO(A)ANTHRACENE	5	0	0	5	0	0	1	0	0	1	0	0
CHRYSENE	5	0	0	5	0	0	1	0	0	1	0	0
DIMETH. BENZ(A)ANTHR	4	0	0	4	0	0	1	0	0	1	0	0
BENZO(E) PYRENE	5	0	0	5	0	0	1	0	0	1	0	0
BENZO(B) FLUORANTHEN	5	0	0	5	0	0	1	0	0	1	0	0
PERYLENE	5	0	0	5	0	0	1	0	0	1	0	0
BENZO(K) FLUORANTHEN	5	0	0	5	0	0	1	0	0	1	0	0
BENZO(A) PYRENE	5	0	0	5	0	0	1	0	0	1	0	0
BENZO(G,H,I) PERYLEN	5	0	0	5	0	0	1	0	0	1	0	0
DIBENZO(A,H) ANTHRAC	5	0	0	5	0	0	1	0	0	1	0	0
INDENO(1,2,3-C,D) PY	5	0	0	5	0	0	1	0	0	1	0	0
BENZO(B) CHRYSENE	5	0	0	5	0	0	1	0	0	1	0	0
CORONENE	5	0	0	5	0	0	1	0	0	1	0	0
*TOTAL SCAN PAH	84	0	0	84	0	0	17	0	0	17	0	0
PESTICIDES & PCB												
ALDRIN	6	0	0	5	0	0	6	0	0	6	0	0
ALPHA BHC	6	0	2	5	0	0	6	0	0	6	0	1
BETA BHC	6	0	0	5	0	0	6	0	0	6	0	0
LINDANE	6	0	0	5	0	0	6	0	0	6	0	0
ALPHA CHLORDANE	6	0	0	5	0	0	6	0	0	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
GAMMA CHLORDANE	6	0	0	5	0	0	6	0	0	6	0	0
DIELDRIN	6	0	0	5	0	0	6	0	0	6	0	0
METHOXYCHLOR	6	0	0	5	0	0	6	0	0	6	0	0
ENDOSULFAN 1	6	0	0	5	0	0	6	0	0	6	0	0
ENDOSULFAN II	6	0	0	5	0	0	6	0	0	6	0	0
ENDRIN	6	0	0	5	0	0	6	0	0	6	0	0
ENDOSULFAN SULPHATE	6	0	0	5	0	0	6	0	0	6	0	0
HEPTACHLOR EPOXIDE	6	0	0	5	0	0	6	0	0	6	0	0
HEPTACHLOR	6	0	0	5	0	0	6	0	0	6	0	0
MIREX	6	0	0	5	0	0	6	0	0	6	0	0
OXYCHLORDANE	6	0	0	5	0	0	6	0	0	6	0	0
OPDDT	6	0	0	5	0	0	6	0	0	6	0	0
PCB	6	0	0	5	0	0	6	0	0	6	0	0
DDD	6	0	0	5	0	0	6	0	0	6	0	0
PPDDE	6	0	0	5	0	0	6	0	0	6	0	0
PPDDT	6	0	0	5	0	0	6	0	0	6	0	0
AMETRINE	6	0	0	6	0	0	.	.	.	.	.	.
ATRAZINE	6	0	2	6	0	1	.	.	.	.	.	.
ATRATONE	6	0	0	6	0	0	.	.	.	.	.	.
CYANAZINE (BLADEX)	6	0	0	6	0	0	.	.	.	.	.	.
DESETHYLATRAZINE	6	0	0	6	0	0	.	.	.	.	.	.
D-ETHYL SIMAZINE	5	0	0	5	0	0	.	.	.	.	.	.
PROMETONE	6	0	0	6	0	0	.	.	.	.	.	.
PROPAZINE	6	0	0	6	0	0	.	.	.	.	.	.
PROMETRYNE	6	0	0	6	0	0	.	.	.	.	.	.
METRIBUZIN (SENCOR)	6	0	0	6	0	0	.	.	.	.	.	.
SIMAZINE	6	0	0	6	0	0	.	.	.	.	.	.
ALACHLOR (LASSO)	6	0	0	6	0	0	.	.	.	.	.	.
METOLACHLOR	6	0	0	6	0	0	.	.	.	.	.	.
HEXACLCYCLOPENTADIEN	1	0	0	0	0	0	1	0	0	1	0	0
*TOTAL SCAN PESTICIDES & PCB	204	0	4	182	0	1	127	0	0	127	0	1
PHENOLICS												
PHENOLICS	6	0	2	4	1	2	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS	6	0	2	4	1	2	0	0	0	0	0	0
SPECIFIC PESTICIDES												
TOXAPHENE	6	0	0	5	0	0	6	0	0	6	0	0
2,4,5-T	1	0	0	2	0	0	.	.	.	.	.	.
2,4-D	1	0	0	2	0	0	.	.	.	.	.	.
2,4-DB	1	0	0	2	0	0	.	.	.	.	.	.
2,4 D PROPIONIC ACID	1	0	0	2	0	0	.	.	.	.	.	.
DICAMBA	1	0	0	1	0	0	.	.	.	.	.	.
PICHLORAM	0	0	0	1	0	0	.	.	.	.	.	.
SILVEX	1	0	0	2	0	0	.	.	.	.	.	.
DIAZINON	1	0	0	2	0	0	.	.	.	.	.	.
DICHLOROVOS	1	0	0	2	0	0	.	.	.	.	.	.
CHLORPYRIFOS	1	0	0	2	0	0	.	.	.	.	.	.
ETHION	1	0	0	2	0	0	.	.	.	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
MALATHION	1	0	0	2	0	0	.	.	.	.	.	.
MEVINPHOS	1	0	0	2	0	0	.	.	.	.	.	.
METHYL PARATHION	1	0	0	2	0	0	.	.	.	.	.	.
METHYLTRITHION	1	0	0	2	0	0	.	.	.	.	.	.
PARATHION	1	0	0	2	0	0	.	.	.	.	.	.
PHORATE	1	0	0	2	0	0	.	.	.	.	.	.
RELDAN	1	0	0	2	0	0	.	.	.	.	.	.
RONNEL	1	0	0	2	0	0	.	.	.	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.	.	.	.
BENONYL	0	0	0	0	0	0	.	.	.	.	.	.
BUX	0	0	0	0	0	0	.	.	.	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.	.	.	.
CICP	2	0	0	2	0	0	.	.	.	.	.	.
DIALLATE	2	0	0	2	0	0	.	.	.	.	.	.
EPTAM	2	0	0	2	0	0	.	.	.	.	.	.
IPC	2	0	0	2	0	0	.	.	.	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.	.	.	.
CARBARYL	2	0	0	2	0	0	.	.	.	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	40	0	0	57	0	0	6	0	0	6	0	0
VOLATILES												
BENZENE	6	0	0	6	0	0	6	0	0	6	0	0
TOLUENE	6	0	0	6	0	1	6	0	0	6	0	0
ETHYLBENZENE	6	0	1	6	0	3	6	0	4	6	0	3
P-XYLENE	6	0	0	6	0	0	6	0	0	6	0	0
M-XYLENE	6	0	0	6	0	0	6	0	0	6	0	0
O-XYLENE	6	0	0	6	0	0	6	0	0	6	0	0
STYRENE	6	0	1	6	0	1	6	0	1	6	0	3
1,1 DICHLOROETHYLENE	6	0	0	6	0	0	6	0	0	6	0	0
METHYLENE CHLORIDE	6	0	0	6	0	0	6	0	0	6	0	0
T1,2DICHLOROETHYLENE	6	0	0	6	0	0	6	0	0	6	0	0
1,1 DICHLOROETHANE	6	0	0	6	0	0	6	0	0	6	0	0
CHLOROFORM	6	0	3	6	6	0	6	6	0	6	6	0
111, TRICHLOROETHANE	6	0	0	6	0	0	6	0	0	6	0	0
1,2 DICHLOROETHANE	6	0	0	6	0	0	6	0	0	6	0	0
CARBON TETRACHLORIDE	6	0	0	6	0	0	6	0	0	6	0	0
1,2 DICHLOROPROPANE	6	0	0	6	0	0	6	0	0	6	0	0
TRICHLOROETHYLENE	6	0	0	6	0	0	6	0	0	6	0	0
DICHLOROBROMOMETHANE	6	0	3	6	6	0	6	6	0	6	6	0
112 TRICHLOROETHANE	6	0	0	6	0	0	6	0	0	6	0	0
CHLORODIBROMOMETHANE	6	0	0	6	6	0	6	6	0	6	6	0
T-CHLOROETHYLENE	6	0	0	6	0	1	6	0	0	6	0	0
BROMOFORM	6	0	0	6	0	6	6	0	6	6	0	6
1122 T-CHLOROETHANE	6	0	0	6	0	0	6	0	0	6	0	0
CHLOROBENZENE	6	0	0	6	0	0	6	0	0	6	0	0
1,4 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0	6	0	0
1,3 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0	6	0	0
1,2 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0	6	0	0
ETHLYENE DIBROMIDE	6	0	0	6	0	0	6	0	0	6	0	0
TOTL TRIHALOMETHANES	6	0	0	6	6	0	6	6	0	6	6	0
*TOTAL SCAN VOLATILES	174	0	8	174	24	12	174	24	11	174	24	12
*TOTAL GROUP ORGANIC	605	2	14	589	25	15	408	24	11	408	24	13

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR		Unreliable: Could Not Confirm By Reanalysis
UCS		Unreliable: Contamination Suspected
UIN		Unreliable: Indeterminate Interference
XP		Positive After X Number Of Hours
T#	(T06)	Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0	GUIDELINE = 0 (A1)		
JAN	BDL	.	.	.	.	.
MAR	4	.	.	.	.	.
MAY	0	.	.	.	.	.
JUL	0	.	.	.	.	.
SEP	1	.	.	.	.	.
NOV	28	.	.	.	.	.
STANDRD PLATE CNT MF (COUNTS/ML)			DET'N LIMIT = 0	GUIDELINE = 500/ML (A3)		
JAN	.	1 <=>	.	4 <=>	.	0 <=>
MAR	.	2 <=>	.	1 <=>	.	2 <=>
MAY	.	0 <=>	.	2 <=>	.	4 <=>
JUL	.	3 <=>	.	6 <=>	.	0 <=>
SEP	.	3 <=>	.	0 <=>	.	1 <=>
NOV	.	8 <=>	.	3 <=>	.	1 <=>
TOTAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0	GUIDELINE = 5/100ML(A1)		
JAN	BDL	.	.	.	.	.
MAR	570	.	.	.	.	.
MAY	30 <=>	.	.	.	.	.
JUL	10 <=>	.	.	.	.	.
SEP	13	.	.	.	.	.
NOV	116	.	.	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	20 <=>	.	.	.	.	.
MAR	1880	.	.	.	.	.
MAY	270	.	.	.	.	.
JUL	1750	.	.	.	.	.
SEP	2233	.	.	.	.	.
NOV	4400	.	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	.100	.200	.150	.100	.100
MAR	.	.100	.500	.050	.100	.050
MAY	.	.100	.500	.100	.050	.050
JUL	.	.100	.	.050	.100	.050
SEP	.	.100	.400	.100	.100	.100
NOV	.	.300	.150	.100	.100	.100
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	.600	.400	.650	.000	.150
MAR	.	.400	.100	.800	.100	.250
MAY	.	.770	.200	.700	.100	.250
JUL	.	.700	.	.750	.050	.200
SEP	.	.800	.300	1.000	.000	.050
NOV	.	.600	.500	.800	.050	.150
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	.700	.600	.800	.100	.250
MAR	.	.500	.600	.850	.200	.300
MAY	.	.870	.700	.800	.150	.300
JUL	.	.800	.	.800	.150	.250
SEP	.	.900	.700	1.100	.100	.150
NOV	.	.900	.650	.900	.150	.250
FLD PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
JAN	7.800	7.350	7.400	7.300	7.450	7.350
MAR	7.900	7.300	7.300	7.300	7.300	7.300
MAY	7.800	7.500	7.400	7.250	7.500	7.500
JUL	7.600	7.300	.	7.300	7.400	7.300
SEP	7.600	7.200	7.200	7.200	7.200	7.200
NOV	8.000	7.450	7.500	7.500	7.550	7.550
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A3)		
JAN	1.000	2.000	10.500	2.500	19.000	6.500
MAR	1.000	3.000	8.000	2.000	17.500	5.000
MAY	9.000	11.000	11.000	11.000	20.000	10.500
JUL	15.000	13.000	.	13.000	23.000	16.000
SEP	20.000	21.000	18.500	20.000	23.500	20.000
NOV	13.000	12.000	16.000	14.000	22.000	14.500
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A	GUIDELINE = 1 (A1)		
JAN	3.900	.110	.160	.130	.170	.180
MAR	37.000	.220	.280	.090	.110	.120
MAY	17.000	.190	.160	.150	.100	.110
JUL	4.700	.220	.	.090	.080	.130
SEP	2.400	.120	.130	.130	.130	.130
NOV	110.000	.060	.170	.090	.170	.160

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 30-500 (A4)		
JAN	100.500	93.700	94.700	94.100	95.500	95.100
MAR	97.500	86.700	86.800	86.700	88.100	88.300
MAY	99.500	92.100	91.700	91.900	93.000	92.700
JUL	99.000	91.300	.	91.900	92.000	92.100
SEP	97.700	89.700	91.100	90.700	90.100	90.600
NOV	99.100	93.200	93.900	93.600	95.000	94.800
CALCIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 100 (F2)		
JAN	34.900	34.900	35.800	35.600	36.600	37.000
MAR	38.900	39.100	35.660	35.930	38.200	37.270
MAY	36.900	36.700	37.500	37.800	36.300	35.800
JUL	35.400	34.600	.	36.000	37.000	37.400
SEP	36.000	35.600	36.200	36.400	36.600	36.600
NOV	38.300	38.700	38.000	37.800	37.900	38.000
CHLORIDE (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 250 (A3)		
JAN	13.300	14.800	14.600	14.600	14.800	14.800
MAR	14.000	14.700	14.600	14.600	15.000	14.800
MAY	13.900	15.100	15.200	15.000	15.100	15.100
JUL	14.100	15.800	.	15.600	15.800	15.700
SEP	14.000	16.000	16.500	16.600	16.400	16.100
NOV	14.600	15.700	15.600	15.500	15.800	16.000
COLOUR (HZU)			DET'N LIMIT = 0.5	GUIDELINE = 5 (A3)		
JAN	2.000 <T	.500 <T	.500 <T	.500 <T	BDL	BDL
MAR	.500	.500 <T	BDL	.500 <T	1.000 <T	.500 <T
MAY	BDL	.500 <T	.500 <T	BDL	.500 <T	.500 <T
JUL	1.000 <T	.500 <T	.	.500 <T	.500 <T	.500 <T
SEP	1.000 <T	.500 <T	.500 <T	.500 <T	.500 <T	.500 <T
NOV	BDL	BDL	.500 <T	.500 <T	.500 <T	.500 <T
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.	GUIDELINE = 400 (F2)		
JAN	282	289	291	290	293	293
MAR	277	289	286	286	294	294
MAY	285	289	290	293	292	292
JUL	282	289	.	285	291	292
SEP	282	288	291	291	291	292
NOV	287	304	303	299	304	303
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)		
JAN	1.900	1.600	1.600	1.600	1.600	1.500
MAR	1.900	1.400	1.400	1.500	1.400	1.400
MAY	2.000	1.900	1.900	1.700	1.800	1.800
JUL	1.800	1.500	.	1.700	1.700	1.700
SEP	2.000	1.800	1.700	1.700	1.700	1.500
NOV	1.900	1.600	1.600	1.600	1.600	1.600
FLUORIDE (MG/L)			DET'N LIMIT = 0.01	GUIDELINE = 2.4 A1)		
JAN	.120	1.260	1.280	1.280	1.400	1.420
MAR	.120	.980	.960	1.040	1.140	1.100
MAY	.120	1.200	1.200	1.200	1.300	1.280
JUL	.120	1.460	.	.460	1.220	1.180
SEP	.120	1.280	1.160	1.260	1.260	1.220
NOV	.140	1.340	1.100	.700	1.120	1.100

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
HARDNESS (MG/L)			DET'N LIMIT = 0.5	GUIDELINE = 80-100 (A4)		
JAN	122.600	122.900	126.400	125.500	128.400	128.700
MAR	131.500	131.700	125.000	127.510	131.400	128.000
MAY	127.200	126.400	128.500	128.900	126.400	124.600
JUL	124.000	122.000	.	127.000	128.000	129.000
SEP	124.000	123.000	125.000	124.000	126.000	125.000
NOV	132.200	133.200	131.300	131.600	130.600	130.900
IONCAL (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
JAN	3.466	1.779	.140	.400	1.018	1.084
MAR	4.367	5.637	.487	2.384	2.758	1.751
MAY	.139	1.574	2.624	2.289	1.391	.495
JUL	.792	1.328	.	.776	1.833	2.867
SEP	.114	.439	.092	.660	1.061	.510
NOV	2.712	1.310	.368	1.045	.008	1.422
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
JAN	.423	.400	.365	.390	.407	.390
MAR	.399	.145	.157	.180	.250	.201
MAY	.452	.374	.341	.324	.342	.295
JUL	.463	.385	.	.356	.346	.391
SEP	.454	.350	.213	.263	.203	.275
NOV	.415	.357	.382	.400	.356	.356
MAGNESIUM (MG/L)			DET'N LIMIT = 0.10	GUIDELINE = 30 (F2)		
JAN	8.650	8.700	9.000	8.900	9.000	8.850
MAR	8.350	8.250	8.700	9.200	8.750	8.550
MAY	8.550	8.450	8.450	8.400	8.700	8.550
JUL	8.700	8.600	.	8.900	8.600	8.800
SEP	8.400	8.300	8.300	8.200	8.300	8.100
NOV	8.900	8.900	8.850	9.000	8.750	8.750
SODIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 200 (A4)		
JAN	7.400	8.000	7.900	7.800	8.200	8.000
MAR	8.300	8.700	7.600	7.600	7.700	8.500
MAY	7.800	8.100	8.100	8.100	8.400	8.400
JUL	8.000	8.600	.	8.000	8.600	8.400
SEP	8.000	8.200	8.200	8.400	8.400	8.400
NOV	7.700	8.000	8.100	7.900	8.000	8.400
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = 0.05 (F2)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL	.002 <T	BDL
JUL	BDL	BDL	.	BDL	BDL	BDL
SEP	BDL	BDL	.002 <T	.002 <T	BDL	.002 <T
NOV	BDL	BDL	.004 <T	.004 <T	.008 <T	BDL
NITRITE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)		
JAN	.006	.003 <T	.003 <T	.002 <T	.005	.003 <T
MAR	.015	.001 <T	BDL	BDL	.001 <T	BDL
MAY	.003 <T	.002 <T	.001 <T	BDL	.002 <T	.001 <T
JUL	.009	.009	.	.003 <T	.004 <T	.006
SEP	.001 <T	.001 <T	.002 <T	.002 <T	.002 <T	.002 <T
NOV	.019	.001 <T	.002 <T	.001 <T	.002 <T	.001 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)		
JAN	.210	.210	.205	.205	.205	.210
MAR	.545	.555	.465	.460	.525	.525
MAY	.215	.220	.200	.200	.235	.220
JUL	.030	.205	.	.190	.200	.205
SEP	.420	.370	.410	.395	.390	.380
NOV	.160	.160	.175	.170	.190	.185
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	.250	.160	.200	.190	.180	.180
MAR	.280	.150	.140	.140	.170	.140
MAY	.270	.190	.230	.200	.180	.180
JUL	.380	.180	.	.170	.230	.180
SEP	.210	.110	.130	.180	.130	.100
NOV	.475	.140	.170	.130	.170	.150
PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
JAN	8.310	8.320	8.270	8.300	8.300	8.280
MAR	8.250	8.050	8.100	8.120	8.160	8.120
MAY	8.320	8.280	8.240	8.220	8.250	8.210
JUL	8.350	8.320	.	8.270	8.250	8.290
SEP	8.340	8.280	8.130	8.180	8.120	8.190
NOV	8.270	8.240	8.270	8.290	8.240	8.240
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = 0.0005	GUIDELINE = N/A		
JAN	.003	.000 <T	.	.	.	.
MAR	.014	.000 <T	.	.	.	.
MAY	.003	BDL	.	.	.	.
JUL	.000 <T	.000 <T	.	.	.	.
SEP	BDL	BDL	.	.	.	.
NOV	.053	.001 <T	.	.	.	.
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = .40 (F2)		
JAN	.022	.005 <T	.	.	.	.
MAR	.055	BDL	.	.	.	.
MAY	.024	.002 <T	.	.	.	.
JUL	.022	.002 <T	.	.	.	.
SEP	.018	.002 <T	.	.	.	.
NOV	.280	.006 <T	.	.	.	.
SULPHATE (MG/L)			DET'N LIMIT = .200	GUIDELINE = 500 (A3)		
JAN	22.620	26.340	26.610	26.450	26.500	26.730
MAR	23.070	31.700	30.330	30.500	31.660	31.790
MAY	23.170	26.440	27.240	28.280	26.430	26.210
JUL	22.690	26.840	.	27.030	27.630	27.550
SEP	22.070	25.540	25.320	25.340	26.530	26.450
NOV	23.750	31.420	30.520	29.700	28.830	27.820
TURBIDITY (FTU)			DET'N LIMIT = 0.05	GUIDELINE = 1 (A1)		
JAN	4.600	4.600	.330	.250	.430	.290
MAR	48.000	.370	.410	.320	.650	.270
MAY	15.000	.350	.530	.310	.520	.220
JUL	3.600	.340	.	.200 <T	.280	.360
SEP	6.800	.310	.350	.280	.280	.380
NOV	200.000 >	.670	.690	.610	.590	.640

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
SILVER (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A1)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	.060 <T	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	.090 <T	BDL	.	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	.320 <T
NOV	BDL	BDL	BDL	BDL	BDL	BDL
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)		
JAN	41.000	53.000	57.000	57.000	37.000	81.000
MAR	330.000	26.000	30.000	29.000	30.000	25.000
MAY	300.000	110.000	89.000	86.000	89.000	77.000
JUL	77.000	75.000	.	72.000	72.000	63.000
SEP	51.000	83.000	77.000	83.000	81.000	.850 <T
NOV	780.000	100.000	93.000	100.000	87.000	75.000
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)		
JAN	.780 <T	.410 <T	.350 <T	.320 <T	.360 <T	.470 <T
MAR	.780 <T	.220 <T	.260 <T	.190 <T	.220 <T	.110 <T
MAY	.750 <T	.360 <T	.430 <T	.270 <T	.350 <T	.330 <T
JUL	.600 <T	.300 <T	.	.390 <T	.210 <T	.250 <T
SEP	.890 <T	.370 <T	.470 <T	.430 <T	.390 <T	.400 <T
NOV	1.700	.160 <T	.370 <T	.430 <T	.170 <T	.390 <T
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)		
JAN	23.000	22.000	22.000	23.000	21.000	22.000
MAR	25.000	20.000	20.000	19.000	20.000	20.000
MAY	24.000	22.000	21.000	21.000	22.000	21.000
JUL	22.000	22.000	.	22.000	24.000	23.000
SEP	21.000	22.000	22.000	22.000	23.000	.170 <T
NOV	34.000	23.000	23.000	22.000	23.000	22.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)		
JAN	22.000	23.000	23.000	23.000	23.000	24.000
MAR	19.000 <T	25.000	20.000 <T	26.000	23.000	33.000
MAY	54.000	60.000	65.000	22.000	33.000	20.000 <T
JUL	19.000 <T	22.000	.	24.000	24.000	25.000
SEP	33.000	28.000	31.000	30.000	24.000	BDL
NOV	27.000	24.000	24.000	25.000	26.000	25.000
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	BDL
MAY	BDL	.080 <T	.100 <T	BDL	BDL	BDL
JUL	BDL	BDL	.	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	.090 <T
NOV	.100 <T	BDL	BDL	BDL	BDL	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	.110 <T	.080 <T	.110 <T	BDL	BDL	BDL
MAY	BDL	BDL	.060 <T	.090 <T	BDL	BDL
JUL	BDL	BDL	.	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	.200 <T
NOV	.070 <T	BDL	.810	BDL	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
COBALT (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	.100 <T	.180 <T	.060 <T	.080 <T	.120 <T	.140 <T
MAR	.560 <T	.090 <T	.070 <T	.080 <T	.090 <T	.090 <T
MAY	.480 <T	.100 <T	.120 <T	.140 <T	.110 <T	.140 <T
JUL	.220 <T	.150 <T	.	.150 <T	.150 <T	.120 <T
SEP	.040 <T	BDL	BDL	.050 <T	BDL	.040 <T
NOV	1.300	BDL	BDL	.060 <T	BDL	BDL
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	.550 <T	1.100 <T	BDL	1.200 <T	BDL	2.400 <T
MAY	2.000 <T	1.700 <T	2.100 <T	BDL	.610 <T	BDL
JUL	BDL	.710 <T	.	1.900 <T	1.500 <T	1.800 <T
SEP	2.300 <T	1.300 <T	1.700 <T	1.700 <T	.590 <T	BDL
NOV	3.000 <T	1.300 <T	1.300 <T	1.300 <T	1.300 <T	1.100 <T
COPPER (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)		
JAN	1.400 <T	1.000 <T	7.700	9.300	450.000	4.900 <T
MAR	2.600 <T	1.000 <T	3.800 <T	1.300 <T	30.000	3.700 <T
MAY	2.300 <T	.940 <T	8.600	2.500 <T	27.000	3.900 <T
JUL	1.600 <T	1.200 <T	.	4.900 <T	18.000	3.500 <T
SEP	1.500 <T	1.100 <T	28.000	4.300 <T	25.000	8.400
NOV	8.400	.970 <T	7.200	2.600 <T	15.000	2.600 <T
IRON (UG/L)			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)		
JAN	76.000	BDL	BDL	BDL	11.000 <T	19.000 <T
MAR	750.000	BDL	BDL	BDL	18.000 <T	18.000 <T
MAY	620.000	8.700 <T	BDL	BDL	12.000 <T	11.000 <T
JUL	170.000	8.800 <T	.	BDL	16.000 <T	11.000 <T
SEP	89.000	10.000 <T	BDL	BDL	12.000 <T	570.000
NOV	1800.000	6.600 <T	18.000 <T	11.000 <T	15.000 <T	15.000 <T
MERCURY (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 1 (A1)		
JAN	.020 <T	.030 <T	.	.	.	.
MAR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUL	BDL	.040 <T	.	.	.	.
SEP	BDL	BDL	.	.	.	.
NOV	.090 <T	BDL	.	.	.	.
MANGANESE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)		
JAN	7.500	.330 <T	.300 <T	.420 <T	2.000	2.200
MAR	58.000	.980	.800	.790	1.200	1.700
MAY	50.000	.440 <T	.870	.560	.760	1.500
JUL	12.000	.460 <T	.	.390 <T	1.300	1.800
SEP	13.000	.500 <T	.700	.390 <T	3.900	1.200
NOV	190.000	.730	.690	.700	1.600	1.900
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	1.100	1.200	1.200	1.300	1.200	1.200
MAR	.530	1.100	1.600	1.200	1.000	1.000
MAY	.510	1.100	1.200	1.200	1.000	1.000
JUL	1.000	1.500	.	1.200	1.200	1.300
SEP	.990	1.300	1.100	1.100	1.000	.100 <T
NOV	.310 <T	1.300	1.300	1.300	1.300	1.300

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)		
JAN	.440 <T	.800 <T	.880 <T	.770 <T	4.300	1.400 <T
MAR	.610 <T	2.800	1.500 <T	.270 <T	.830 <T	.640 <T
MAY	1.500 <T	.610 <T	1.600 <T	.860 <T	1.400 <T	1.000 <T
JUL	.750 <T	.870 <T	.	.650 <T	1.200 <T	.870 <T
SEP	.660 <T	.600 <T	5.000	.780 <T	1.800 <T	1.800 <T
NOV	2.300	BDL	.980 <T	BDL	.560 <T	.250 <T
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)		
JAN	.210 <T	.070 <T	1.300	1.800	8.000	1.400
MAR	1.200	.070 <T	1.100	.190 <T	2.000	.310 <T
MAY	.890	.100 <T	.980	.340 <T	2.400	.400 <T
JUL	.220 <T	BDL	.	.350 <T	2.200	.600
SEP	.140 <T	BDL	9.300	.540	3.200	.130 <T
NOV	3.000	.310 <T	1.100	.310 <T	2.000	.330 <T
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)		
JAN	.490 <T	.600	.470 <T	.480 <T	.510	.500 <T
MAR	.300 <T	.400 <T	.470 <T	.420 <T	.570	.520
MAY	.200 <T	.360 <T	.360 <T	.610	.640	.620
JUL	.660	.640	.	.420 <T	.690	.630
SEP	.320 <T	.410 <T	.330 <T	.440 <T	.470 <T	.190 <T
NOV	.310 <T	.390 <T	.530	.460 <T	.560	.560
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	1.500 <T	BDL	BDL	1.400 <T	1.500 <T
MAY	BDL	1.200 <T	BDL	1.200 <T	1.200 <T	1.700 <T
JUL	BDL	1.800 <T	.	1.700 <T	2.000 <T	1.400 <T
SEP	BDL	BDL	BDL	BDL	BDL	8.500
NOV	BDL	BDL	BDL	BDL	BDL	BDL
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A		
JAN	160.000	160.000	160.000	160.000	160.000	160.000
MAR	160.000	150.000	150.000	160.000	160.000	160.000
MAY	160.000	150.000	150.000	150.000	150.000	150.000
JUL	150.000	150.000	.	150.000	150.000	150.000
SEP	150.000	150.000	150.000	160.000	160.000	1.500
NOV	190.000	150.000	150.000	160.000	160.000	150.000
TITANIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = N/A		
JAN	4.000 <T	2.700 <T	2.400 <T	2.600 <T	2.200 <T	2.800 <T
MAR	8.200	4.300 <T	3.500 <T	3.000 <T	4.400 <T	4.500 <T
MAY	13.000	6.300	6.500	5.700	6.200	6.200
JUL	7.900	5.600	.	4.300 <T	5.700	5.900
SEP	6.400	5.400	5.600	4.800 <T	4.900 <T	3.300 <T
NOV	13.000	3.100 <T	3.000 <T	2.900 <T	3.100 <T	3.500 <T
THALLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 13 (D4)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	.	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	.160 <T
NOV	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
URANIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (A1)		
JAN	.350 <T	.300 <T	.300 <T	.330 <T	.250 <T	.320 <T
MAR	.390 <T	.240 <T	.210 <T	.210 <T	.250 <T	.250 <T
MAY	.370 <T	.230 <T	.280 <T	.280 <T	.290 <T	.310 <T
JUL	.310 <T	.210 <T	.	.250 <T	.240 <T	.220 <T
SEP	.320 <T	.250 <T	.240 <T	.290 <T	.240 <T	.150 <T
NOV	.450 <T	.310 <T	.290 <T	.280 <T	.250 <T	.290 <T
VANADIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	.380 <T	.450 <T	.470 <T	.450 <T	.330 <T	.460 <T
MAR	1.100	.580	.620	.550	.590	.500 <T
MAY	.880	.380 <T	.380 <T	.440 <T	.500 <T	.400 <T
JUL	.400 <T	.480 <T	.	.470 <T	.550	.470 <T
SEP	.390 <T	.510	.480 <T	.500 <T	.500 <T	.090 <T
NOV	2.300	.630	.530	.560	.560	.500 <T
ZINC (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 5000 (A3)		
JAN	2.000 <T	1.400 <T	4.000	10.000	34.000	2.900
MAR	5.800	1.400 <T	9.500	1.600 <T	6.000	1.700 <T
MAY	3.500	1.200 <T	19.000	4.100	5.200	1.200 <T
JUL	3.300	3.000	.	4.600	5.200	2.000 <T
SEP	1.000 <T	2.100	39.000	3.200	7.300	.550 <T
NOV	11.000	2.100	9.800	3.500	6.200	2.100

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB						
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 700 (G)		
JAN	1.000 <T	BDL	.	BDL	.	BDL
MAR	1.000 <T	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	1.000 <T
SEP	BDL	BDL	.	BDL	.	BDL
NOV	BDL	!!S	.	BDL	.	BDL
ATRAZINE (NG/L)			DET'N LIMIT = 50	GUIDELINE = 60000 (A2)		
JAN	BDL	BDL	.	.	.	.
MAR	110.000 <T	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUL	BDL	BDL	.	.	.	.
SEP	140.000 <T	90.000 <T	.	.	.	.
NOV	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L)	PHENOLICS		DET'N LIMIT = .20	GUIDELINE = 2 (A4)		
JAN	.600 <T	1.200	.	.	.	.
MAR	.400 <T	.	.	.	.	.
MAY	BDL	.	.	.	.	.
JUL	BDL	.600 <T	.	.	.	.
SEP	BDL	.600 <T	.	.	.	.
NOV	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
TOLUENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 24 (A3)		
JAN	BDL	.050 <T	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)		
JAN	BDL	BDL	.	BDL	.	BDL
MAR	BDL	.150 <T	.	.100 <T	.	.100 <T
MAY	BDL	.100 <T	.	.100 <T	.	.150 <T
JUL	BDL	.150 <T	.	.050 <T	.	BDL
SEP	.050 <T	BDL	.	BDL	.	.050 <T
NOV	BDL	BDL	.	.050 <T	.	BDL
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)		
JAN	BDL	BDL	.	BDL	.	BDL
MAR	BDL	.100 <T	.	BDL	.	.100 <T
MAY	BDL	BDL	.	BDL	.	.200 <T
JUL	BDL	BDL	.	.050 <T	.	BDL
SEP	.100 <T	BDL	.	BDL	.	.050 <T
NOV	BDL	BDL	.	BDL	.	BDL
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)		
JAN	BDL	16.900	.	16.500	.	14.400
MAR	BDL	12.300	.	15.300	.	13.700
MAY	.200 <T	18.600	.	16.100	.	16.000
JUL	BDL	12.600	.	14.500	.	15.800
SEP	.200 <T	16.300	.	23.400	.	21.400
NOV	.100 <T	12.300	.	13.900	.	13.800
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)		
JAN	BDL	11.350	.	11.000	.	10.600
MAR	BDL	9.500	.	10.950	.	10.100
MAY	BDL	10.850	.	10.050	.	9.850
JUL	.050 <T	9.100	.	8.900	.	10.200
SEP	.150 <T	9.800	.	12.700	.	12.200
NOV	.100 <T	8.800	.	9.350	.	9.750

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ST THOMAS (ELGIN WSS) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BROMOFORM (UG/L)			DET'N LIMIT = 0.20		GUIDELINE = 350 (A1+)	
JAN	BDL	.400 <T	.	.600 <T	.	.600 <T
MAR	BDL	.400 <T	.	.400 <T	.	.400 <T
MAY	BDL	.600 <T	.	.400 <T	.	.600 <T
JUL	BDL	.600 <T	.	.400 <T	.	.400 <T
SEP	BDL	.400 <T	.	.400 <T	.	.600 <T
NOV	BDL	.600 <T	.	.600 <T	.	.600 <T
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50		GUIDELINE = 350 (A1)	
JAN	BDL	32.700	.	33.400	.	30.500
MAR	BDL	26.350	.	31.450	.	28.700
MAY	BDL	35.300	.	31.600	.	31.300
JUL	BDL	26.600	.	28.100	.	31.400
SEP	BDL	30.750	.	41.500	.	39.200
NOV	BDL	26.250	.	28.900	.	29.150

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL
This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: POCODO UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION: **NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.
USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF

OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap tnree times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled
Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)

Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.
2. Record time of day on submission sheet.
3. Record temperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)

Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top

Steps:

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.